

PHOTOGRAPHS OF THE SOLAR ECLIPSE.

The Impressions Professor Horton Made, and the Impressions Made on Him. The Philadelphia Photographer, published by Benamer & Wilson, at Seventh and Cherry streets, contains in its September number four photographs of different phases of the great solar eclipse, August 7, 1869, together with a full report of the Government astronomical and photographic expedition sent to Iowa to observe and photograph the eclipse.

We present from Professor Morton a vivid and exact paper the following extracts: We were told by Professor Morton that the moon would soon reach the sun. Plates were prepared at once ready to get a picture of first contact. Professor Watson was to signal by lifting his hand at the moment. Our plate was in the camera and the slide drawn, while we watched for the signal. Up went the hand; click! went the stop, and the first exposure was made, the plate showing on development the least contact, looking like the impression made upon an apple by the thumb when testing its ripeness. Negatives were then made at intervals of five to ten minutes until totality took place, and after totality until the eclipse was ended and over.

Three of our party, however, were martyred to science, and these were the men in the dark-room. More persons living in the United States have seen Niagara or the Mammoth Cave or the Yosemite Valley than have seen a total eclipse, and it will be A. D. 1901 before another can be seen, yet these men stuck to their work like heroes and saw nothing of the totality.

And now, how shall we convey to our readers an idea of what a total eclipse is like? We were continually interrupted making exposures, yet between them we witnessed—a grand, an awe-inspiring sight, which we shall never forget. How shall we describe it? In the year 1842 there was a total eclipse of the sun visible in the south of France. Arago tells us that at Perpignan nearly 20,000 persons, smoked glass in hand, stood ready to witness it, and shouted aloud when it came. Had we the descriptive power of those 20,000 we could not describe our impressions during totality. We had read many descriptions of a total eclipse; but studied up the matter with photographic views of one; thought we knew just what to expect and how it would look. Our information on the subject only added to our surprise.

Our position enabled us to watch the progress of the eclipse nicely. About a quarter of an hour after contact the diminution in the light began to be quite perceptible, and near totality the air became so much cooler that having a linen coat on we wished for a warmer one. The air seemed as it does when a storm is gathering overhead. A bank of clouds in the south, which were not visible when the sun was shining fully, now began to assume color—first a silver glare, then grey, then yellowish, and finally a bright orange-red color. The blue of the sky changed into various colors, too, and our companion's faces began to assume rather a livid appearance. The changes were very gradual. With our mind upon our work, anxious lest we should fail, we had less opportunity to watch the phenomena than we desired, but what we saw we remembered. Totality took place. It was dark, but not the darkness of night. These pages could hardly be read at the time. We have seen moonlight nights brighter than it was then. We could all readily see to do our work. As we had chances to lift our eyes upward, oh what a sight met them! A moment before the narrowest rim of the sun was shining brightly the eye could not gaze upon it without pain. Now, the struggle is over for the moment; the moon has gained the victory and the sun is eclipsed! The light had passed away instantly, like the flames of a great fire sometimes do, when, with the grand leap upward, they fall suddenly, mastered by the water thrown upon them—like the snuffing of a candle in a dark room.

There, hung in the heavens, eye, between heaven and earth, upheld by the hand of God, were the two great orbs face to face. A great round shadow; all around it a brilliant circle of light, of a brownish golden color, broken here and there at irregular intervals by the brighter pink protuberances of irregular size and shape, crowned by the glorious, glory, of a bright shooting, its sheafs of rays in all directions, weakest where the protuberances were largest, but all-inspiring, awe-inspiring, wonderful, glorious, making one feel that our Creator must be near at hand to bring about such a display of His wonders and almighty power. Silence reigned. Nothing could be heard but the counts of the astronomers, and the click of our drop as each plate was exposed. There it hung, a great picture displayed by the Almighty to His creatures. Oh, what a sight! We looked overhead once, and our eyes met several stars which seemed to rebuke us for looking at them. The same feeling of reproof came over us as the protuberance on the lower edge of the sun was looked at time and again. Four plates had now been exposed; and now, as we looked, "God said let there be light, and there was light," for then came a bright dazzling flash of light, triumphant, like the victor of some great conquest; like the leaping of the waters as they reach the falls at Niagara; like the joy that broke upon the heart of the aggrieved father at the sight of the returned prodigal; like the state that followed when our Saviour said, "Lazarus, come forth!" The battle was decided, and the sun the victor. The people who had crowded around hailed the victor with shouts of triumph loud and long. The shadow moved rapidly on as if chagrined, and the light began to grow brighter and brighter. The mighty glow of the day had only been mastered for a moment, as it were, to come out more brightly, warmly, and generally, to scatter his blessed light upon us.

Ah! how little can what we have written give you an idea of the glory of that phenomenon. The Protuberances.—Examination of the negatives show us that five seconds was more than sufficient to secure all the details of the protuberances, although it gave no decided indication of the corona. The development proceeded slowly in all but a few spots, where very massive protuberances were located, and thus it was not thought, at the moment, judicious to try shorter exposures; but, in the light of our present experience, we would judge that exposures of even one or two seconds, with

peristential development, such as could be best carried out on albumenized plates, would be of value to secure details in the rounded and massive protuberances which appear at some points. It is a curious coincidence that in this case, as well as in the pictures made by De la Rue in 1860, and the German and English party last year, all the more interesting protuberances are situated on the border of the sun furthest from the advancing moon, and are thus best shown in the pictures first exposed. The most conspicuous protuberance is that which, at a hasty glance, appears to resemble the letter x, but on more careful inspection, is perceived to be like an ear of corn. It consists of a solid central mass inclined at angle of about 45 deg. to the normal at the solar surface, and with three branches from near its upper end, one sweeping backwards in a direction generally parallel to the solar surface, another forward, as concerns the direction of the general mass, and a third branching out a little below and running in the same direction as this last. The appearance of the main body, which is of a spindle shape, and with spiral markings, is highly suggestive of a vertical motion which has swept these whiffs of light matter into their peculiar positions.

It was believed by several observers that this object moved rapidly while they were watching it; but as the same positions are shown in the eight different negatives taken at Burlington and Ottumwa, which contain it, there can be no doubt of its permanent character. It appears, however, beyond doubt, that motion, amid the light surrounding the sun, was observed, as there is much accordant testimony on the subject. But this motion, as we shall presently see, there is every reason to believe, existed in the corona, and not in the protuberances, which, however, might easily have the appearance of movement, if seen against a background of shifting light. To this subject we shall refer again when speaking of the corona. Immediately to the right of this ear of corn is seen a region of soft light, among which rise two similar spindle-shaped masses, inclining towards the ear of corn.

To the left appears a mass of rolling cloud, disposed in beautiful streams and curls, like the smoke from a bonfire or burning meadow, swept gently towards one side by a light wind. In connection with these are some small masses, entirely detached and floating above the general body, as was the case in De la Rue's pictures. Other solid nodular masses appear at other points, but the next most notable protuberance is one which attracted the attention of all observers, and appeared to occupy a position on the lowermost edge of the sun. It is most clearly shown in the last pictures taken at each station, and resembles in shape a great whale with a body made up of dense cumulus cloud-matter, with a long tail clinging close to the solar edge, and stretching some 40,000 miles along. The length of the entire mass is about 110,000 miles, and the height of its more bulky portion about 28,000 miles; while its length being about 70,000 miles, we would have for its cubic capacity, assuming that its extent in the remaining direction is equal to its height, about 54,580,000,000,000 cubic miles.

To the right of this, and only showing its entire length in the last picture of each series, is a caterpillar-like mass of cloud-matter, very much like the solid rolls of horizontal vapor which are sometimes seen passing over a sheet of water. At one end rises a projecting head, but the rest clings closely to the solar edge, and is indented with ring-like divisions, giving it much the aspect of a huge worm.

The Western Accommodation Train runs daily, except Sunday. For this train tickets must be procured and baggage delivered by 5 P. M., at No. 116 Market street.

These facts have peculiar significance when taken in connection with others developed by observations made during this same eclipse. In the first place, Professor E. C. Pickering, of the Massachusetts Institute of Technology, in his work with our party at Mt. Pleasant for the purpose of making various physical observations, found that while the sky was strongly polarized all around close up to the corona, that object itself was not a source of polarized light.

The instrument employed was a tube, having at one end a large plate of quartz, and at the other a double image prism of Iceland spar, made in the manner known as the prism of Rochon.

On looking through this at the corona, the entire circle was in field with a part of the surrounding sky, and two entirely distinct images of the entire area were seen, the corona in both being colorless, but projected on a ground of tints, complementary in the two images.

This would certainly indicate that the light of the corona was not reflected sunlight. With a spectroscope arranged to analyze the entire light from the totality phase, Professor Pickering also found no dark lines in the spectrum. This also points in the same direction. It would thus seem almost certain that the corona is simply an electric discharge, no doubt varying with great rapidity, as we see in the case of the aurora; and to its variations we may attribute those apparent motions of the protuberances which have been observed by so many, but which our large series of photographs so conclusively shows not to have any actual existence.

BARGH, FARRELL & WARREN DEALERS IN PAPERS OF ALL KINDS, NO. 631 CHESTNUT STREET AND NO. 624 JAYNE STREET, PHILADELPHIA.

RAILROAD LINES. FOR CAPE MAY, VIA WEST JERSEY RAILROAD. COMMENCING MONDAY, AUGUST 3, 1869. Leave Philadelphia, foot of Market street, at following times: 9:00 A. M., Cape May Express, due 12:30. 3:15 P. M., Cape May Passenger, due 7:15. Sunday Mail Train leaves at 7:15 A. M., due 10:45. Cape May Freight leaves Camden daily at 9:30 A. M.

RAILROAD LINES. BRADING RAILROAD—GREAT TRUNK LINE FROM PHILADELPHIA TO THE INTERIOR OF PENNSYLVANIA. THE SCHUYLKILL, SUSQUEHANNA, CUMBERLAND, AND WYOMING VALLEYS.

PHILADELPHIA AND ERIE RAILROAD. On and after MONDAY, Sept. 6, 1869, the Trains on the Philadelphia and Erie Railroad will run as follows from Pennsylvania Railroad Depot, West Philadelphia: WESTWARD.

PENNSYLVANIA CENTRAL RAILROAD. The trains of the Pennsylvania Central Railroad leave the Depot, at THIRTY-FIRST and MARKET streets, which is reached directly by the Market street cars, the time of departure being as follows: Leaving Front and Market streets thirty minutes before its departure. The Chesnut and Walnut streets cars run within one square of the Depot.

PHILADELPHIA, WILMINGTON, AND BALTIMORE RAILROAD—TIME TABLE. Trains leave Depot corner Broad street and Washington avenue as follows: Way Mail Train at 8:30 A. M. (Sunday excepted), for Baltimore, stopping at all regular stations.

PHILADELPHIA AND BALTIMORE CENTRAL RAILROAD. Stopping at all stations between Philadelphia and Wilmington. Leave Philadelphia at 11:00 A. M., 2:30, 5:00, and 7:00 P. M. The 8:00 P. M. Train connects with Delaware Railroad for Harrington and intermediate stations.

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